

NEW GENERATION MAZDA3 DIESEL

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1. *ATA GLANCE*

The Mazda3 Diesel is the latest addition to the New Generation Mazda3 range that has been so well received by the Australian public since its launch in April. Offering the class leading styling and dynamics expected from every Mazda3, the Mazda3 Diesel adopts a new common rail 2.2 litre turbo-diesel engine for class-leading torque and further improvements in fuel efficiency.

Overview

- Mazda3 Diesel blends sporty driving and expressive design with strong environmental and safety performance
- Mazda3 Diesel adopts the expressive and aggressive new look that was first revealed on the New Generation Mazda3 range
- Power and torque are increased over 2.0 litre petrol models but with improvements in fuel efficiency and environmental performance
- Mazda3 Diesel becomes the most fuel-efficient Mazda small car ever delivering fuel economy of just 5.7 litres per 100km (combined cycle) and 5.0 litres per 100km (extra urban)
- With the addition of the Mazda3 Diesel to the range, customers now have the choice of five Diesel passenger vehicles: Mazda3 Diesel Hatch or Sedan, Mazda6 Diesel Sports Hatch, Mazda6 Diesel Wagon and CX-7 Diesel Sports

Equipment

- New Mazda3 Diesel is available in two body styles: a four-door sedan and a five-door hatch
- High levels of **interior equipment** include:
Air-conditioning, Bluetooth audio (MP3 compatible), cruise control, leather wrapped gear shift knob and steering wheel, multi information display with ambient temperature gauge, Bluetooth (hands-free compatible), maintenance monitor, satellite navigation and trip computer, power windows and mirrors, MP3 / WMA compatible in-dash 6-disc CD player with six speakers and auxiliary input, steering wheel mounted audio controls
- Noise, Vibration and Harshness suppression improves by up to 11 percent thanks to aerodynamic refinements, increased suspension rigidity, optimal positioning of vibration dampening material, increased body and panel rigidity

- Sporty and sophisticated interior design that combines a sense of roominess with a dashboard turned to the driver to create Mazda's signature one-with-the-car feel
- Use of soft-grained material on the upper section of the dashboard combines with minimal parting lines to achieve a vastly improved look of interior quality
- Sedan boot capacity up 17 litres to 430 litres
- More efficient air-conditioning with 20 percent larger heat exchanger and 50 percent larger air compressor
- Gearshift lever placed closer to driver for easier shifting
- Stirrup-shaped head restraints have been introduced, which are lower and less obstructive when looking rearward
- State of the art ergonomics and HMI with 'zone layout' for less distraction from the road
- New 4.1-inch multi-information display (MID)
- Hands-free system for Bluetooth®-equipped approved mobile phones and MP3 players
- **Exterior highlights** include:
 - 16 inch alloy wheels, body coloured door handles and mirrors, body kit comprising rear spoiler and side skirts, front fog lamps
- Aerodynamics improved with drag coefficient (Cd) of only 0.31 (sedan) and 0.33 (hatchback), down 0.01 for each body style and among the leaders in its class
- Sedan is 105mm longer, hatchback is 60mm longer than previous Mazda3 Diesel. Both are 5mm taller

Mechanical Changes

Diesel powertrain

The New Generation Mazda3 Diesel features:

- 2.2-litre in-line 4-cylinder 16-valve DOHC common-rail turbocharged diesel engine
 - More responsive engine character and improved fuel economy
 - Matched to revised six-speed manual transmission
 - 110kW @ 3,500rpm
 - 360Nm @ 1,800rpm (Class-leading)
 - 5% improvement in fuel economy: 5.7L/100km (combined) (prev: 6.0)
 - Refinement in Variable Geometry Turbocharger (VGT) design for improved efficiency
 - Improvements to fuel pump design allowing better control and higher injection pressure
 - Revised piston design for improved efficiency and emissions performance
 - Reduced CO₂ emissions 150g/km (prev: 160)
 - Diesel Particulate Filter (DPF) improved for further emissions performance

Chassis and Structure

- Major evolution of Mazda's small-car platform delivers better balance between sporting prowess and ride refinement
- Larger dimensions, increased body strength and crash-worthiness and higher safety and equipment levels
- Mazda engineers kept weight increases to a minimum. For example when comparing Mazda3 Diesel with superseded Mazda3 Diesel model weight increase is only 30kg despite larger displacement engine and more equipment
- New Generation Mazda3 up to 11 percent quieter at 60km/h
- 17 percent increase in use of high and ultra-high strength steel
- Double-digit increases in flexural and torsional criteria for improved handling and safety
- Newly-evolved MacPherson strut front suspension
- Newly-evolved multilink rear suspension
- Electro-hydraulic power assist steering (EHPAS) introduced for a light yet stable steering feel and reduced fuel consumption

Safety

- Dynamic Stability Control (DSC)
- Traction Control System (TCS)
- Antilock Braking System (ABS)
- Electronic Brakeforce Distribution (EBD)
- Emergency Brake Assist (EBA)
- Driver's front SRS airbag
- Passenger's front SRS airbag
- Front-side SRS airbags
- Front and rear curtain airbags
- Active front head restraints
- Intrusion-minimising brake and clutch pedal

2. PRICING

With Dynamic Stability Control standard on all Mazda3 models and integrated Satellite Navigation standard on half the range, New Generation Mazda3 sets small car benchmarks for affordable luxury.

New Generation Mazda3 Range

	<u>6-speed manual</u>	<u>5-speed Activematic</u>
Mazda3 Neo Sedan	\$21,330	\$23,330
Mazda3 Neo Hatch	\$21,330	\$23,330
Mazda3 Maxx Sedan	\$24,240	\$26,240
Mazda3 Maxx Hatch	\$24,240	\$26,240
Mazda3 Maxx Sport Sedan	\$26,845	\$28,845
Mazda3 Maxx Sport Hatch	\$26,845	\$28,845
Mazda3 Diesel Sedan	\$29,715	N/A
Mazda3 Diesel Hatch	\$29,715	N/A
Mazda3 SP25 Sedan	\$29,740	\$31,920
Mazda3 SP25 Hatch	\$29,740	\$31,920

Options

Safety Pack (Side and Curtain Airbags)	\$485	(Neo only)
Luxury Pack:	\$2,320	(SP25 only)
- Leather seat trim		
- Bose premium 10-speaker system with subwoofer		
- sliding centre console armrest		
Power sliding glass sunroof	\$1,545	(SP25 Luxury only)

Sales forecast

Mazda Australia expects to sell 30,000 New Generation Mazda3 models per year in Australia.

<u>Model</u>		<u>Body style</u>	
Neo	30%	Four-door sedan	55%
Maxx	10%	Five-door hatchback	45%
Maxx Sport	30%		
SP25	25%	<u>Transmission</u>	
Diesel	5%	6-speed manual	40%
		5-speed Activematic	60%

3. DESIGN AND AERODYNAMICS

Expressive & Aggressive

The striking design of the New Generation Mazda3 has now been carried across to the Mazda3 Diesel. Modelled on the styling of the Mazda3 Maxx Sport, the only exterior difference is that the Mazda3 Diesel carries the MZR-CD badge on the rear and additional ventilation for the intercooler on the left hand side fog lamp bezel.

Exterior Design – Expressive and Refined

A new integrated front bumper design with a single front grille is adopted, framed by large openings at the corners that hint at the Mazda3's sporty nature. Because the front grille is positioned lower, designers could extend the front of the bonnet further down towards the bumper. They then framed it in powerful front wheel arches for a strong-shouldered look reminiscent of Mazda's sports icon, the RX-8, and applied across the line-up on the sports crossover CX-7, the Mazda2 and Mazda6.

The new hatchback silhouette adds an aggressive note with a deeply-etched character line at the side sills, a subtle rising belt line, a newly-designed C-pillar, flat roof line and rear roof spoiler.

The sedan has a smoother silhouette with a high rear deck, a spoiler at the top of the boot opening and a rounder roofline that accentuates its compact, coupe-like dimensions making it look sophisticated and sporty.

The New Generation Mazda3's rear end design is inherited from the successful outgoing model, but finessed to enhance its road hugging, powerful presence. The deep edge of the side-panel belt line rises over the rear wheels and the rear lamps, and then falls into the firm rear bumper. This is combined with a new C-pillar design and large combination rear lamps for even more depth and expressiveness.

Centre-focus Design, Panel Sculpturing and a Cleaner Look

The New Generation Mazda3 expresses next-generation Mazda design DNA that gives it a subtle aggressiveness and sets it apart in the compact segment. It has a clean and dynamic design with few protruding surfaces for a look of solid build quality.

To achieve this effect, designers employed a centre-focus design at the front and back. For example, all lines at the front of the car focus on a centre point at the top of the five-point grille and a new, subtle character line in the middle of the bonnet serves as a centre axis. The lines running from the A-pillars along the sides of the bonnet move inwards to the centre of the grille. The headlamp inner lines, front fender lines and the frame of the front grille all move inwards towards the centre as well.

For a clean, well-built look there is a new windshield wiper arm design, washer nozzles sit inside the cowl and front window mouldings flow smoothly into the roof mouldings.

The silhouette of the New Generation Mazda3 features a deep character line rising under the doors and a well-defined belt line rising to connect to the top of the rear lamps. These are three-dimensional and designed to reflect natural light from the surroundings. The hatchback combines this with a flat roofline for a sporty look, while the sedan's roofline is rounder adding sophistication.

Like the front, the rear of the car focuses all components on the Mazda logo and has bold curves and a low centre of gravity. The rear end is a product of Mazda's advanced panel stamping technology with a three-dimensionality that is powerful and strong.

With the introduction of the New Generation Mazda3 came five new exterior colours, totalling eight for Australians to choose from. They were all developed to support the exterior design's sculptured look, especially at the sides where natural light and shadows can change the look of the car depending on the angle you see it. New colours include Celestial Blue, Indigo Lights, Aluminium, Gunmetal Blue and Graphite.

Page 26: Mazda3 Body Colours

New Headlamps and Rear Combination Lamps

The New Generation Mazda3 Diesel has front and rear lamp designs that fit with the car's sporty theme. The standard headlamp design is longer and more three dimensional, which emphasises the cylindrical lamps inside the outer frames. A new orange-coloured, boomerang-shaped flair is placed on the outer edge of the lamp for a touch of quality.

The rear combination lamps differ according to body style. For the five-door hatchback, the base model has a red inner lens while the sedan has rear lamps that include a chrome-look fascia around the reverse and turn signal lamps for a more three-dimensional look.

Best-in-Class Aerodynamics

The New Generation Mazda3 is more aerodynamic – reducing wind noise and fuel consumption. Repeated clay model development and wind tunnel tests brought improvements to every detail of aerodynamic performance before the final design was chosen.

In total designers conducted 304 hours of wind tunnel testing over 34 days at our Miyoshi Proving Ground. This revealed where the flow of air could be optimised while also minimising turbulence and eddies on each part of the body. The process involved day after day of intensive work as the clay models were shaped, refined and modified in millimetre increments.

Mazda designers concentrated on achieving the right balance of improved aerodynamic performance and a perfect design for the front. It was a process that involved repeated discussions and tests. Their hard work produced a fusion of form and function that gives New Generation Mazda3 a fresh, distinctive front ‘face’ and achieves a class-leading drag coefficient of 0.31 for the sedan and 0.33 for the hatchback.

From the front grille, with a projected area of 2.217m², to the roof, the underbody and the rear end aerodynamic optimisation measures contribute to driving stability and low wind noise at high speed and helps make the New Generation Mazda3 Diesel as fuel-efficient as possible.

The grille opening is kept small – it's actually only 80 percent of the size of the combined openings on the first-generation Mazda3 – to concentrate wind pressure, lessen the intake of air and drag, while directing unwanted air smoothly over the front body. A new front bumper reinforcement flange ensures smooth air flow here. A new cooling fan speed flap prevents the fan from causing drag at high speed, while an air guide in the front bumper directs air straight to the radiator and cooling system where it's needed. The front upper body corners direct air smoothly along the upper side body and a special A-pillar design prevents air-flow separation and the turbulence associated with it.

At the back of the New Generation Mazda3 the rear lamps are shaped to reduce turbulence. To keep air flow smooth and turbulence at a minimum under the car, new round front tyre deflectors are introduced (similar to the horseshoe deflectors first seen on Mazda6).

Interior Design

The interior design of the New Generation Mazda3 is stylish and dynamic delivering a quality feel and Mazda's trademark at-one-with-the-driver feel. It achieves a wrap-around feeling for the driver and is designed to feel roomy and comfortable for up to five people. Every interior detail embodies an optimal balance between aesthetics and function for a clean, uncluttered look. The quality feel of each part has been improved, high quality materials used and interactive lighting introduced to create an interior that is great to be in and use on a daily basis.

The “Sweeping S” Dashboard Design

When seen from the side the dashboard sweeps from the base of the windshield and then down for a distinctive concave shape. The floor console between the seats rises up to meet the centre panel in a smooth, convex shape. Together, this forms a ‘sweeping S’ design that is unique and dynamic. The dashboard adopts a single hood design that begins on the far left edge of the centre console and sweeps in a wide arch up and over to the outer side of the driver cluster for a quality and sporty look.

Use of High Quality Materials

Material chosen for their superior quality is applied to areas of the New Generation Mazda3 interior where occupants see and touch most often. The side trim armrest surface, the floor console lid and the dashboard are covered with very high quality soft-feel material. In addition, the Mazda3 Diesel uses leather on the steering wheel and gear shift knob. Silver-finish accents are used at the bottom left and right of the dashboard (at the lower end of the dashboard on the driver’s side) and the upper section of the centre panel has a lustrous finish that contrasts nicely with the grain of the surrounding material.

Fewer seams and dividing lines at the top of instrument panel, centre console and door trim also contribute to a high quality appearance. The glove box now uses catches on both sides, so that the receiving parts do not protrude, giving a smooth glove box surface. And by introducing fully surrounding door seals, the doors have a high quality look when open.

4. COMFORT, FUNCTION AND EQUIPMENT

The Driver's Environment

The New Generation Mazda3 provides comfort, space and practicality on the inside. There are new seats for better comfort on longer trips, plenty of small-item storage, an evolved Human-Machine Interface (HMI), one of the segment's most generous road views and a host of new equipment. Furthermore, the New Generation Mazda3 is quieter than ever before.

To match its sporty nature and design, the New Generation Mazda3 has a driver's environment with a strong sense of being one with the car. A *zone layout cockpit* design, with an evolved HMI was developed to achieve this.

After carefully studying the eyes of a driver looking at the road while driving, Mazda designers positioned information displays in zones where they can be seen with the least effort. For an intuitive feel while driving, all vehicle controls are placed in a single narrow zone, stretching from the outside rim of the steering wheel to the gearshift knob.

Under its single hood is a new dash-mounted multi information display that is operated by a handy selector switch on the steering wheel. Audio functions are operated by using the control panel buttons on the left side of the steering wheel, while other vehicle systems are controlled by new multi-functional dials on the centre panel.

New multi information display

A new multi information display is introduced that shows all essential information in one location at the touch of a button on the steering wheel. This function now includes:

- 4.1-inch full colour thin film transistor liquid crystal display (TFT–LCD)
- Switches on the right of steering wheel allows switching between displays without taking your hands from the wheel
- Trip computer readout shows current fuel consumption, average fuel consumption, distance-to-empty, average vehicle speed and speed alert
- Fully integrated Satellite Navigation is controlled via easy-to-use switches mounted on the steering wheel
- Audio system information
- Maintenance reminders and other settings

Maximum comfort means maximum control

Driving a Mazda3 has never been more comfortable: the driver can adjust the seat to take full advantage of the high position of the floor console's armrest. A new location of the gear shift knob, closer to the driver, enables shifting without having to lift the arm from the armrest. And the distance is now shorter when moving the hand to the steering wheel, because the gear shift lever is 60mm higher and slanted towards the driver.

Even the pedals were redesigned to make driving smoother and easier. The accelerator pedal now has 15mm more space to operate in and the brake pedal arm and the brake pedal pad are optimised. Together, this makes moving a normal to large-sized foot from the accelerator to the brake smooth and unimpeded.

An Action Illumination system is onboard that causes the audio controls to react intuitively to touch.

Seats and Road View

Passengers in the New Generation Mazda3 can relax and enjoy the ride in even greater comfort than before. The New Generation Mazda3 adopts seats with a larger contact area for the lower back to ensure good comfort even on long drives. The new seat adds seat cushion sides that are 20mm larger, boosting leg comfort and hold. And it has new seat backs that are extended by 35mm, encouraging good posture.

Once the driver has found the right position behind the wheel, the field of vision in all directions is one of the segment's most generous. For instance, a new design and position of the A-pillars result in a wider field of vision for the driver to the front and sides. Stirrup-shaped head restraints are introduced, which are lower and less obstructive when looking rearward. And the rear tailgate window (hatchback) is wider and shaped to give more downward visibility.

Onboard Storage

The New Generation Mazda3 is made to match the Australian lifestyle, and that means plenty of clever storage spaces and cupholders. Beneath the armrest between the front seats is a large storage box with 4.9 litres capacity, the AUX-in jack and an additional power supply. Between this and the gear shift lever is a double cupholder and a storage box with lid (for a mobile phone, MP3 player, etc). To the left of the driver is a coin holder and a new glove-box that holds up to 9.7 litres.

There are cupholders in each door pocket, front and back, a seatback pocket for holding maps or books, and two cupholders in the pop-down rear seat armrest. Behind the back seats, the sedan offers 430 litres of load capacity (17 litres more than the previous model), with 340 litres for the hatchback. Of course, the back seats can be folded down 60/40 to create a load area for large item transport, and there is a sub-trunk beneath the boot floor that can hold tools and other items.

5. REFINEMENT

Lowering Noise, Vibration and Harshness (NVH)

All engines in the New Generation Mazda3 line-up have been updated to be even more refined and quiet. Measures taken here include:

- Rubber stoppers added around each engine mount and making the mounts more rigid
- New front suspension hanger brackets
- Optimised tailpipe section of rear bumper wrapping reduces exhaust noise reaching the cabin

Chassis vibration (perceived as road noise) is also held to a minimum by strengthening vital components and joints. In fact, the New Generation Mazda3 has one of the segment's lowest road noise sound-pressure levels. This is achieved by:

- A new gearbox mount at the centre of front suspension to suppress vertical vibration of the crossmember
- Using thicker metal sheeting for suspension housing reinforcements
- Joining the rear suspension towers to the D-pillars
- Optimising rear seat belt anchors
- Optimising the shape of the instrument panel and making the steering column support member more rigid (for less vibration when idling and driving)
- Using a more rigid centre roof reinforcement
- Using new ribbing in the doors, double-layer, wrap-around door seals, outer door trim seals and rigid door sashes
- Using a thick dash panel upper plate
- Damping material under the rear seats and insulation material in the C/D-pillar framework

Wind noise has been kept as low as possible, resulting in wind noise performance of just 59dB (100 km/h with a 5 m/s crosswind). Measures taken here include:

- Adopting a radius shaped A-pillar that reduces vortexes and wind noise
- Employing a new side mirror design
- Lowering idle position for the windscreen wiper blades
- Adding dampening material to the cabin ceiling

6. DIESEL POWERTRAIN

Sporty and Fuel-Efficient

To further bolster Mazda's *Sustainable Zoom-Zoom* strategy, the New Generation Mazda3 now adds the responsive and fuel-efficient 2.2 litre MZR-CD diesel engine to complement the existing 2.0 litre and 2.5 litre petrol engines already available.

MZR-CD 2.2L engine

Introduced for the New Generation Mazda3 Diesel is the newly developed MZR-CD 2.2L engine that also powers the Mazda6 Diesel. It is a 2.2-litre DOHC 16-valve common-rail turbocharged diesel engine.

The MZR-CD 2.2L is a clean running, high-performance turbo-diesel engine that delivers top-of-class levels of torque, fuel economy and quietness. The exhaust emissions system is the same as for the Mazda6, but it is tuned differently for the new Mazda3 Diesel, and it complies with Euro Stage IV exhaust emissions regulations. To reduce CO₂ emissions while also improving fuel economy, the MZR-CD 2.2L diesel engine uses a smaller turbocharger than on the Mazda6 Diesel and the gear ratio has been raised to ensure positive response at low speeds. The measures taken assist in improving driving performance, while also realising a substantial 5% improvement in fuel economy.

In the development stage, Mazda engineers made it their mission to build an engine which is environmentally responsible, and to offer a driving experience that is relaxing and at the same time more than capable of offering the additional grunt required for overtaking manoeuvres. To accomplish this mission engineers had to polish engine performance to achieve world class levels of power and torque and to offer a comfortable drive on long trips, all while delivering exceptional fuel economy and emissions performance.

Power and torque

Producing maximum torque of 360Nm makes the MZR-CD 2.2L engine a class leader among C-segment diesel rivals.

Mazda engineers focused on three technological points of evolution to achieve torque of 360Nm from a 2.2-litre diesel engine. The first involved turbocharger technology. The blades used on the Variable Geometry Turbocharger (VGT) on the previous engine were lengthened for the new MZR-CD 2.2L engine while also adopting a more streamlined shape, a change that makes turbocharger operation highly efficient across a broad range of engine speeds.

The next evolution involved the fuel delivery system. Improvements to the fuel pump allowed fuel pressure to be raised to 200MPa over the already ultra-high pressure of 180MPa. This allows greater freedom in setting fuel injection timing, frequency and volume, and results in improved output throughout the engine's range. Highly responsive solenoids have been adopted to speed up the minimum injection interval by around 30% improving responsiveness and lowering emissions. Further enhancements made to the common-rail diesel system mean that the number of injector holes has been increased from 6 to 10. The increased number of smaller (just 0.119mm) holes helps optimise combustion.

And the third technological evolution concerns the pistons. To maximise the conversion of energy produced by combustion into engine torque, the pistons were revised to better handle the high pressure and temperature of combustion. This was achieved by adopting a new aluminium material that improved strength and resistance to high-temperature fatigue. The top piston ring was changed to a half keystone ring that improves carbon emissions performance, and adopts a hollow ring carrier that improves the cooling ability of the top ring's groove.

Response

It is Mazda's aim to provide customers with true driving pleasure across all engine types which makes us fully aware of the importance of positive response, even when dealing with diesel powerplants.

To improve turbo response, we added a streamlined shape to the blades of the turbocharger, as well as a seal on the compressor side to reduce the clearance between the blade and the housing. An additional measure taken was to add fine control over the fuel injection pattern when transitioning to boost.

These measures ensure highly competitive acceleration characteristics in a C-segment car. In addition, 1.7 seconds has been taken off the time taken to accelerate from 50km/h to 100km/h in suburban driving scenes when compared to the previous MZR-CD 2.0L engine.

Fuel economy

The MZR-CD 2.2L engine for the new Mazda3 Diesel improves fuel economy by 5% over the MZR-CD 2.0L engine that powered the first-generation Mazda3 Diesel. Fuel economy has improved from 6.0 litres per 100km to 5.7 litres per 100km.

Normal thinking would suggest that fuel consumption suffers as displacement increases. However, improvements to the fuel injector and a change to a lower compression ratio contribute to improved fuel economy.

The low compression ratio and subsequent reduction in temperature secure time for fuel mixing prior to combustion, while the use of an injector that excels at vaporising the fuel spray and delivers fast response allows for a more accurate fuel injection pattern. This realises appropriate fuel injection timing and reduces particulate matter (PM), which results in lower fuel consumption.

The MZR-CD 2.2L engine uses ceramic glow plugs and a fuel injector that excels at vaporizing the fuel spray. These have allowed the compression ratio to be lowered to 16.3:1.

Exhaust emissions performance

The application of high-response injection technology and an EGR system with a cooler bypass mechanism enables the Mazda3 Diesel to reduce raw emissions, achieve high performance in exhaust gas cleaning and comply with Euro Stage IV emissions regulations.

The fuel injection nozzles were made roughly 20% smaller in surface area, and the number of holes increased from six to ten to achieve the desired fuel spray composition. Additionally, the high response solenoid used by the injector shortens the minimum interval between sprays by 30%. The result is power output and emissions performance that is amongst the best in the class.

The addition of a cooler bypass mechanism to the EGR system greatly reduces the amount of unburned gas as well as NOx.

Exhaust gas cleansing technologies include Mazda's own Diesel Particulate Filter (DPF) that introduces the world's first application of new technology. Its use doubles the regenerative interval of the DPF in NEDC mode, and cuts the time needed for regeneration to just 1/3 that of previous systems.

Previous DPF systems created a reaction between soot on the catalyst's particulate surface and oxygen contained in the exhaust gases to convert it to CO₂. For that reason, the amount of oxygen on the catalyst surface decided the time required for DPF regeneration. Speeding the process by increasing temperature led to the technical issues related to the ceramic material exceeding its thermal limit.

Mazda developed the use of a highly heat resistant material for the ceramic monolith, while at the same time creating passageways for oxygen within the ceramic support material, a structure that allowed a greater amount of oxygen to be effectively used. And this approach succeeded in greatly increasing the speed with which the soot is burned.

Quietness

In addition to the astounding performance in terms of power output and emissions performance, the MZR-CD 2.2L engine also continues the segment-leading quiet performance that earned the MZR-CD 2.0L engine such high acclaim. The MZR-CD 2.2L engine adds a new lower block to its construction. The new lower block is made of highly rigid aluminium alloy, and it joins with the cylinder block's main bearing caps and cylinder skirt bottoms in a manner that increases overall rigidity. Despite the high level of engine output, the highly rigid nature of this structure suppresses and dissipates engine vibration noise.

The front chain drive cassette-type balance shaft suppresses NVH. The use of the balance shaft greatly reduces booming noise inside the car to establish a pleasing relationship between accelerator operation and a linear engine sound. The overall effect is one that enhances the aural component of driving pleasure.

Packaging and weight reduction

The new technologies described above were introduced to evolve the performance of the MZR-CD 2.0L engine and, starting from that base, make the MZR-CD 2.2L engine an even better powerplant. While some of the innovations, such as the balance shaft, take up space and add weight, various efforts to minimise any increases in weight or size resulted in a final package that remains about the same size and weighs just 6kg more than the MZR-CD 2.0L engine.

Here are some examples of the structural and mechanical efforts made toward this goal. The stroke of the MZR-CD 2.2L engine has been lengthened by about 8mm to achieve its larger displacement. But, introducing the balance shaft to minimize the vibration that might be caused by the piston's reciprocating motion allowed the connecting rods to be shortened, and this contributed to overall weight reduction of the cylinder block and related components. (The balance shaft makes a difference of 1.9kg to the cylinder block, and 1.3kg to the crankshaft.) As a result, the same block as for the MZR-CD 2.0L engine could be used.

Integrating the balance shaft housing with the oil pump housing and oil suction pipe to form a single structure also allowed for a reduction in overall weight.

Efforts made to use lighter materials included a change to aluminium for the oil cooler. This achieves both a (0.6kg) reduction in weight as well as improved cooling performance. And the cam cover was changed to a plastic material, (for a weight saving of 1.0kg).

All told, the various measures realised a package that comes in at about the same size as the MZR-CD 2.0L engine.

Mazda Six-speed manual transmission

The Mazda3 Diesel comes standard with a six-speed manual transmission. The gear ratios of the manual transmission have been tuned for the New Generation Mazda3 to provide a more consistent feel to each gear.

As with the petrol manual models, the gearbox now features triple-cone synchronisers between first and second gear to make it easier and faster to slot that important first gearchange.

7. CHASSIS AND STRUCTURE

One-With-The-Car Driving Feel

As with the petrol variants of the New Generation Mazda3, Mazda3 Diesel has chassis systems designed to deliver agile handling, superior roll control and a flat ride that is comfortable and predictable at all times. The new car's rigid body shell and optimised suspension with electro-hydraulic power assist steering, get the most out of the car's compact dimensions and lively engine to deliver optimal one-with-the-car driving feel. Overall, the New Generation Mazda3 perpetuates the lightweight strategy that characterises Mazda engineering.

A Rigid Body Shell Structure

To ensure handling befitting a sporty New Generation Mazda compact, the New Generation Mazda3 body shell has been strengthened at precisely those locations subjected to high stress.

For both body styles, the joints of the header junction are strengthened by two rows of vertical spot welds. A large corner radius is adopted for the door openings, and a new roof gusset is employed between the roof and the B-pillar. The body seals for the wheel arches and the front hinge pillars are now weld-bonded for extra rigidity, and an increased number of spot welds and weld-bonding are used on the door openings. A strut bar is introduced between the cowl member and the front suspension towers for extra strength here as well.

For the hatchback body shell, the D-pillars and the rear end and header use a robust, closed-section structure for excellent stiffness. A brace bar is introduced to the rear suspension towers, the number of spot welds on the tailgate opening increased and a large corner radius is used. With these body shell measures, along with an increased use of high and ultra-high-strength steel throughout, the New Generation Mazda3 has extremely rigid structures with little deformation even at the wide opening of the hatchback's tailgate.

Suspension Systems

Attached to this highly rigid body is a MacPherson strut front suspension and Mazda's multilink rear suspension. These ensure agile response to steering input, superior roll control and a predictable, comfortable ride. At the front axle, the New Generation Mazda3 delivers superior roll control with a stabiliser mounting span increased by 20mm. A stronger crossmember tower is introduced that is made of stamped metal, the structure here was changed to make the cross-arm thicker and the crossmember bushings were optimised to deliver excellent lateral rigidity.

The multilink rear suspension has a centre member with a new shape that contributes to lateral strength and good road holding. Like the front suspension, the mounting span of the rear stabilisers are larger, which improves roll control and the monotube dampers that performed so well in the outgoing model are carried over for their excellent tracking ability.

Electro-Hydraulic Power Assist Steering aboard all versions

Like the petrol versions of the New Generation Mazda3, the Mazda3 Diesel has fuel-saving, Electro-Hydraulic Power Assist Steering (EHPAS). This is the same system that earned high praise on some versions of the outgoing model, with updates to make it a perfect match to the sporty nature of the new model.

Increasing the number of steering gear mount bushes from two to three creates an optimal balance between rigidity feel and low vibration. The steering gear bushes also have a softer setting in the straight-ahead position, which does away with unwanted vibrations to the steering wheel. And finally, a larger gear cylinder diameter is used to ensure excellent power assist function when you need it.

Brake system that instils greater confidence and improves controllability

The brake system for the New Generation Mazda3 Diesel carries over the callipers, pads and other components that earned high acclaim on the first-generation Mazda3 but are increased in size over 2.0 litre petrol models. Ventilated front discs are 300mm while solid rear discs are 280mm. In addition, the vacuum booster has been tuned and the feeling of initial brake application optimised to provide drivers with braking performance that is reassuring regardless of the scene or situation, and that excels in terms of controllability.

An additional change was to improve the feeling of system rigidity when braking at mid to high G force, and to improve vehicle stability during braking. The overall result is outstanding response and reassuring linearity under all braking conditions.

8. SAFETY - ACTIVE AND PASSIVE

Class-Leading Technologies

Mazda's Sustainable Zoom-Zoom not only focuses on producing technologies that have less of an impact on the environment, but also on bringing cutting-edge safety features to all Mazda products. The New Generation Mazda3 Diesel reflects this focus with an outstanding active and passive safety package that includes advanced technologies.

Improvements in running, turning and stopping achieves stress-free driving performance giving the driver predictable control of the vehicle and ensuring every Mazda3 Diesel driver remains in a safe frame of mind.

Active Safety

Mazda3 Diesel comes with a state-of-the-art active safety portfolio which includes Dynamic Stability Control (DSC), Traction Control System (TCS), Antilock Braking System (ABS), Electronic Brakeforce Distribution (EBD), and Emergency Brake Assist (EBA).

All these systems share a common goal; ensuring the driver has as much control over the vehicle in adverse conditions as cutting-edge technology can provide.

Combine this armoury of active safety features with the New Generation Mazda3's dynamic prowess and responsiveness, and the result is one of the safest small cars in Australia.

Passive Safety

The New Generation Mazda3 is designed to provide high levels of crash resistance and occupant protection. Its body structure uses Mazda's triple-H architecture, with strong H-shaped reinforcements in the floor, side frames and roof. High and ultra-high strength steel was used throughout the body to ensure crash resistance; the reinforcements and inners are made of high-tensile steel at the A-pillar, the hinge pillar reinforcement and the side sills. The joint between the hinge pillars and A-pillar inner panels was lowered too, and spot welding used, to ensure that the joints do not open at the seams during a hefty impact.

New Generation Mazda3 has a front end structure that dissipates impact energy from the front through the entire vehicle, sparing the cabin as much as possible. A cross-car beam is also placed between the hinge pillars that helps dissipate energy before it reaches the cabin. A special undercarriage structure is designed to create a crushable zone at the front by causing the engine, transmission and suspension crossmember mounts to separate from the body structure in case of a major frontal impact.

The door impact beams are newly located with reinforcements added to their front sections, which helps reduce intrusion into the cabin during side impact. The area with energy-absorbing material used on the inside of the door and door trim are enlarged as well, and a door trim armrest with a crushable design is introduced to help reduce the chance of injury here. At the back the rear side frames are made of tailored blank high-tensile steel and have a thicker and straighter crossbeam. Its structure is designed to dissipate collision energy to the front and away from where the fuel tank is positioned.

Active Front Head Restraints and Six Airbags

On the inside, the Mazda3 Diesel's safety package includes active front head restraints that protect the neck against whiplash along with front, side and curtain airbags. The curtain airbags are newly-developed and mounted to the top of the B-pillars. This reduces inflation time by 4/1000th of a second, provides a large protection area and excellent energy absorption.

Also standard are seatbelts now with double pretensioners and digressive Load-Limiter Retractors (LLR), which are better at restricting body movement and at helping reduce shock to the passenger's chest. A crushable clutch and brake pedal, crushable pads below the heel area, a new shape for the steering wheel adjustment lever and an energy-absorbing steering column are onboard to help prevent injury to the driver's lower legs and chest. Additionally, soft, energy-absorbing ribs are installed at each corner of the cabin.

Mazda continues to develop and improve its pedestrian safety features with the New Generation Mazda3. Its bonnet is made with an energy-absorbing structure at the cowl and fender bracket areas, to help reduce injury when struck. Energy-absorbing foam is used in the bumper beams and energy-absorbing plastic in the bumper's lower section, to reduce injury severity to the legs here as well.

9. BODY COLOURS

Eight colour choices, five new

Mazda Australia does not charge extra for Mica or Metallic paint colours, a saving of \$700 or more against some rivals.

New colours include: Celestial Blue, Indigo Lights, Aluminium, Gunmetal Blue and Graphite.



Crystal White Pearl
Mica



Aluminium
Metallic



Celestial Blue
Mica



Gunmetal Blue
Mica



Velocity Red
Mica



Graphite
Mica



Indigo Lights
Mica



Black
Mica



Mazda3 Diesel
Black cloth

10. ENVIRONMENT

Mazda vehicles up to 95 percent recyclable

***Sustainable Zoom-Zoom* focuses just as heavily on the recyclability of every component of every New Generation Mazda3.**

Recycling, Eliminating Toxins and ISO 14001

The vehicles of the current Mazda line-up are approximately 95 percent recyclable at the end of their life. Since 2005, Mazda has used a unique 'bumper to bumper recycling technology' that takes material from damaged bumpers and makes new bumpers out of it. The second-generation Mazda3 was designed using this, and has easily recyclable polypropylene (PP) in the front and rear bumpers, the instrument panel and cabin trim.

The New Generation Mazda3 is also built with very few substances that pollute the environment when discarded. It uses no lead in the fuel tank, wire harness and in its electro-undercoating; and it has no hexavalent chromium or cadmium in any components.

The New Generation Mazda3 is also produced in an environmentally-friendly facility in Japan. Mazda has been an industry leader in this, and was ISO 14001 (environment management standard) certified over ten year ago – including the Hofu Plant, where the New Generation Mazda3 is assembled.

11. SPECIFICATIONS

		Diesel
Powertrain		
Engine type		2.2 litre in-line 4 cylinder 16 valve turbocharged diesel DOHC S-VT
Engine capacity	cc	2,184
Bore and stroke	mm	86.0 x 94.0
Compression ratio		16.3 : 1
Maximum power	kW	110 @ 3,500 rpm
Maximum torque	Nm	360 @ 1,800 rpm
Throttle control		Electronic (drive-by-wire)
Fuel system		Multipoint electronic fuel injection
Fuel tank capacity	l	55
Recommended fuel		Diesel
Fuel consumption*1	man (combined)	5.7 litres per 100km
Manual transmission		6-speed
Gear ratio	1st -	3.538
	2nd	1.913
	3rd	1.218
	4th	0.88
	5th	0.809
	6th	0.717
	reverse	3.831
	final drive	1st - 4th: 3.421 5th - 6th: 2.954
Chassis		
Brake type	front	Ventilated disc
	rear	Solid disc
Brake diameter	front (mm)	300
	rear (mm)	280
Steering type		Electro hydraulic power assist steering
Suspension	front	MacPherson strut
	rear	Multi-link
Turning circle	kerb to kerb (m)	10.9
Tyre size		205/55R16 91V
Wheel size		16 x 6.5 J
Wheel type		Alloy
Wheel type (spare)		Temporary
Dimensions		
Ground clearance	laden (mm)	120
Overall height	mm	1,470

Overall length	hatch (mm)	4,460
	sedan (mm)	4,580
Overall width		1,755
Track	front (mm)	1,535
	rear (mm)	1,520
Wheelbase	mm	2,640
Cargo room volume (VDA)	hatch (l)	340
	sedan (l)	430
Kerb weight	hatch (kg)	1,456
	sedan (kg)	1,438
Towing capacity*2	braked (kg)	900
	unbraked (kg)	550

*1 Fuel consumption figures are based on ADR81/02 test results. They are useful in comparing the fuel consumption of different vehicles. They may not be the fuel consumption achieved in practice. This will depend on traffic and road conditions and how the vehicle is driven.

*2 Subject to State or Territory regulations.

12. EQUIPMENT

		Mazda3 Diesel
Exterior		
Body kit comprising:	rear spoiler	X
	side skirts	X
Door handles (body coloured)		X
Exhaust extension (chrome)		X
Fog-lamps (front)		X
Front and rear bumpers (body coloured)		X
Green tinted windscreen, side and rear windows		X
Headlamps (halogen)		X
Metallic/Mica paint		X
Power mirrors (body coloured)		X
Power windows		X
Roof rack mounting points		X
Interior		
Air-conditioning		X
Centre armrest console with tray		X
Critical function warning lights/chimes		X
Cruise control		X
Cupholders		X
Digital clock		X
Door ajar warning light		X
Door pockets (front)		X
Driver's left footrest		X
Glove box (illuminated)		X
Illuminated entry system with delayed fade		X
Instrument panel light dimmer		X
Interior illumination:	cargo room lamp	X
	ignition key surround	X

		Mazda3 Diesel
	map reading spot lamps	X
	power window switch (driver)	X
Interior release for:	boot lid	sedan only
	fuel filler door	X
Leather-wrapped:	gear shift knob	X
	steering wheel	X
Lights-left-on audible warning		X
Low fuel warning light		X
Multi information display with:	ambient temperature gauge	X
	Bluetooth® (hands-free compatible)	X
	maintenance monitor	X
	satellite navigation	X
	trip computer*3	X
Passenger assist grips (front and rear)		X
Seat trim:	cloth	X
	leather*4	-
Seats (front) with:	adjustable head restraints	X
	height adjustment (driver)	X
	rake and slide adjustment	X
	seat back pocket (passenger)	X
Seats (rear) with:	60/40 split fold backrest	X
	adjustable head restraints	X
	centre fold down armrest	X

		Mazda3 Diesel
Tachometer and electronic odometer/tripmeter		X
Tilt and telescopic adjustable steering wheel		X
Vanity mirrors (front)		X
Ventilation pollen filter		X
Window demister (rear)		X
Wipers (front) 2-speed with variable intermittent function		X
Wiper (rear) with intermittent function		hatch only

*3 Trip computer comprises: current and average fuel consumption, distance to empty, average vehicle speed and speed alert

*4 Leather interior includes some Maztex material on selected high impact surfaces

Audio		
AM/FM tuner		X
Auxiliary input (3.5mm MP3 player compatible) and 12 volt power outlet		X
Bluetooth® audio (MP3 player compatible)		X
CD player, in-dash 6-disc (MP3 compatible)		X
Speakers, number of		6
Steering wheel mounted audio controls		X
Safety		
Active head restraints (front)		X
Airbags SRS:	front (driver and passenger)	X
	side (front)	X
	curtain (front and rear)	X
Anti-lock Braking System (ABS)		X
Child restraint anchor points		X

		Mazda3 Diesel
Collapsible steering column		X
Dynamic Stability Control (DSC) - switchable on/off		X
Electronic Brake-force Distribution (EBD)		X
Emergency Brake Assist (EBA)		X
Engine immobiliser		X
High mount stop lamp		X
Intrusion-minimising brake pedal		X
Intrusion-minimising clutch pedal		X
Left-hand-side convex (wide angle) exterior mirror		X
One touch (up and down) power window (driver)		X
Remote boot release		sedan only
Remote central locking (2 transmitters with retractable key)		X
Seat-belt warning audible and visual (front)		X
Seat-belts (front) with pretensioners, load-limiters and height adjustable shoulder anchorages		X
Seat-belts 3-point lap-sash (all seats)		X
Side impact door beams		X
Traction Control System (TCS)		X
'Triple H' safety construction with front and rear crumple zones		X

NOTES